

CLAIMS

1. An immunotherapeutic composition comprising an isolated nucleic acid capable of producing an infectious Kunjin virus together with a carrier, diluent or excipient, which upon administration to an animal, elicits a protective immune  
5 response to at least another flavivirus.
2. The immunotherapeutic composition of Claim 1, wherein the isolated nucleic acid corresponds to substantially an entire genome of a Kunjin virus.
3. The immunotherapeutic composition of Claim 2, wherein said isolated nucleic acid encodes at least one attenuating mutation.
- 10 4. The immunotherapeutic composition of Claim 2, wherein said isolated nucleic acid encodes at least one attenuating mutation in a Kunjin virus non-structural protein.
5. The immunotherapeutic composition of Claim 4, wherein the attenuating mutation is located at an amino acid residue selected from the group consisting of:  
15 Proline residue 250 of nonstructural protein NS1; Alanine residue 30 of nonstructural protein NS2A; Asparagine residue 101 of nonstructural protein NS2A; and Proline residue 270 of nonstructural protein NS5.
6. The immunotherapeutic composition of Claim 5, wherein the mutation is selected from the group consisting of: Proline residue 250 of the NS1 protein  
20 substituted by an amino acid selected from the group consisting of leucine, valine and alanine; Alanine 30 substituted by Proline in the nonstructural protein NS2A; Asparagine 101 substituted by Aspartate in the nonstructural protein NS2A; and Proline 270 substituted by Serine in the nonstructural protein NS5.
7. The immunotherapeutic composition of Claim 2, wherein said isolated  
25 nucleic acid encodes at least one attenuating mutation in a Kunjin virus structural protein.
8. The immunotherapeutic composition of Claim 7, wherein the Kunjin virus structural protein is E protein.
9. The immunotherapeutic composition of Claim 8, wherein the attenuating  
30 mutation is located an amino acid residue selected from the group consisting of: residue 49, residue 138, residue 306 and residue 390 of E protein.

10. The immunotherapeutic composition of Claim 9, wherein the attenuating mutation is Glu390 to Gly.
11. The immunotherapeutic composition of Claim 1, wherein the isolated nucleic acid is DNA that is operably linked to a promoter so that the DNA is expressible in a mammalian cell.
12. The immunotherapeutic composition of Claim 1, wherein the isolated nucleic acid is RNA.
13. The immunotherapeutic composition of Claim 12, wherein the RNA is packaged into virions
14. The immunotherapeutic composition of Claim 1, wherein said at least another flavivirus is more pathogenic than Kunjin virus.
15. The immunotherapeutic composition of Claim 14, wherein said at least another flavivirus is a West Nile virus.
16. The immunotherapeutic composition of Claim 15, wherein said West Nile virus is NY99 strain West Nile virus.
17. A method of immunizing an animal including the step of administering an isolated nucleic acid capable of producing an infectious Kunjin virus to said animal to thereby elicit a protective immune response to at least another flavivirus.
18. The method of Claim 17, wherein the isolated nucleic acid corresponds to substantially an entire genome of a Kunjin virus.
19. The method of Claim 18, wherein said isolated nucleic acid encodes at least one attenuating mutation.
20. The method of Claim 19, wherein the said isolated nucleic acid is DNA operably linked to a promoter operable in a mammalian cell.
21. The method of Claim 19, wherein the isolated nucleic acid is RNA.
22. The method of Claim 21, wherein the RNA is packaged in virions.
23. The method of Claim 17, wherein said at least another flavivirus is more pathogenic than Kunjin virus.
24. The method of Claim 23, wherein said at least another flavivirus is a West Nile virus.
25. The method of Claim 24, wherein said West Nile virus is NY99 strain West Nile virus.

26. The method of Claim 17, wherein the animal is a mammal.
27. The method of Claim 26, wherein the mammal is an equine.
28. The method of Claim 26, wherein the mammal is a human.
29. The method of Claim 17, wherein the animal is an avian.
- 5 30. A non-human animal immunized according to the method of Claim 17.
31. The non-human animal of Claim 30, which is an equine.
32. The non-human animal of Claim 30, which is an avian.
33. An immunocompetent biological material isolated from an animal immunized according to Claim 17.
- 10 34. The immunocompetent biological material of Claim 33, which comprises one or more lymphocytes and/or antigen-presenting cells.
35. The immunocompetent biological material of Claim 34, which comprises plasma and/or serum.
36. A method of using Kunjin virus to identify another flavivirus against  
15 which Kunjin virus is suitable for use as an immunogen, said method including the steps of:
- (i) administering an isolated nucleic acid capable of producing an infectious Kunjin virus to an animal; and
- (ii) determining whether said animal is protectively immunized against  
20 infection by another flavivirus;
- wherein if said animal is protectively immunized against said another flavivirus, Kunjin virus is suitable for use as an immunogen against said another flavivirus.
37. The method of Claim 36, wherein said another flavivirus is more  
25 pathogenic than Kunjin virus.